Digital Stadium DTN: Second Season

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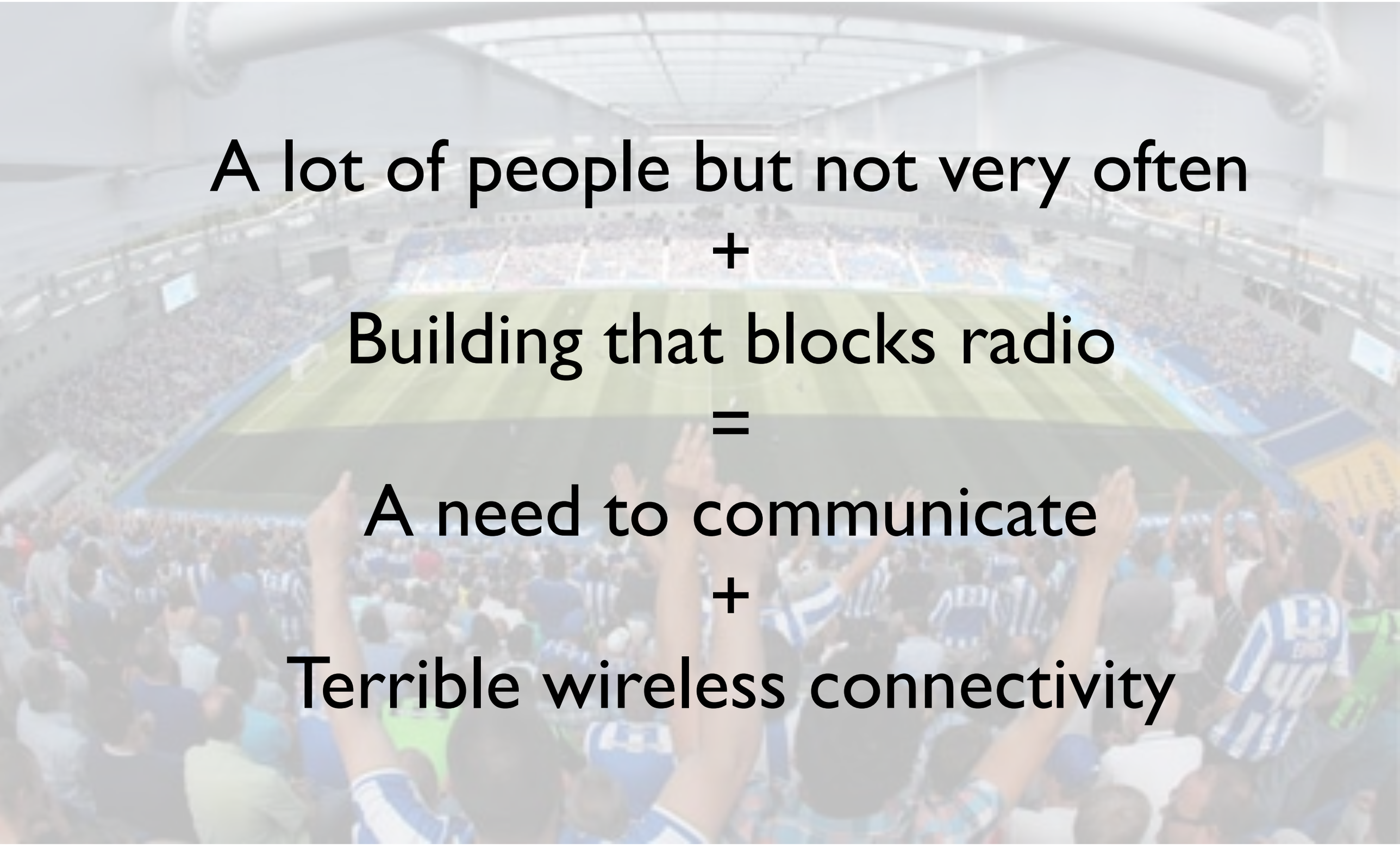
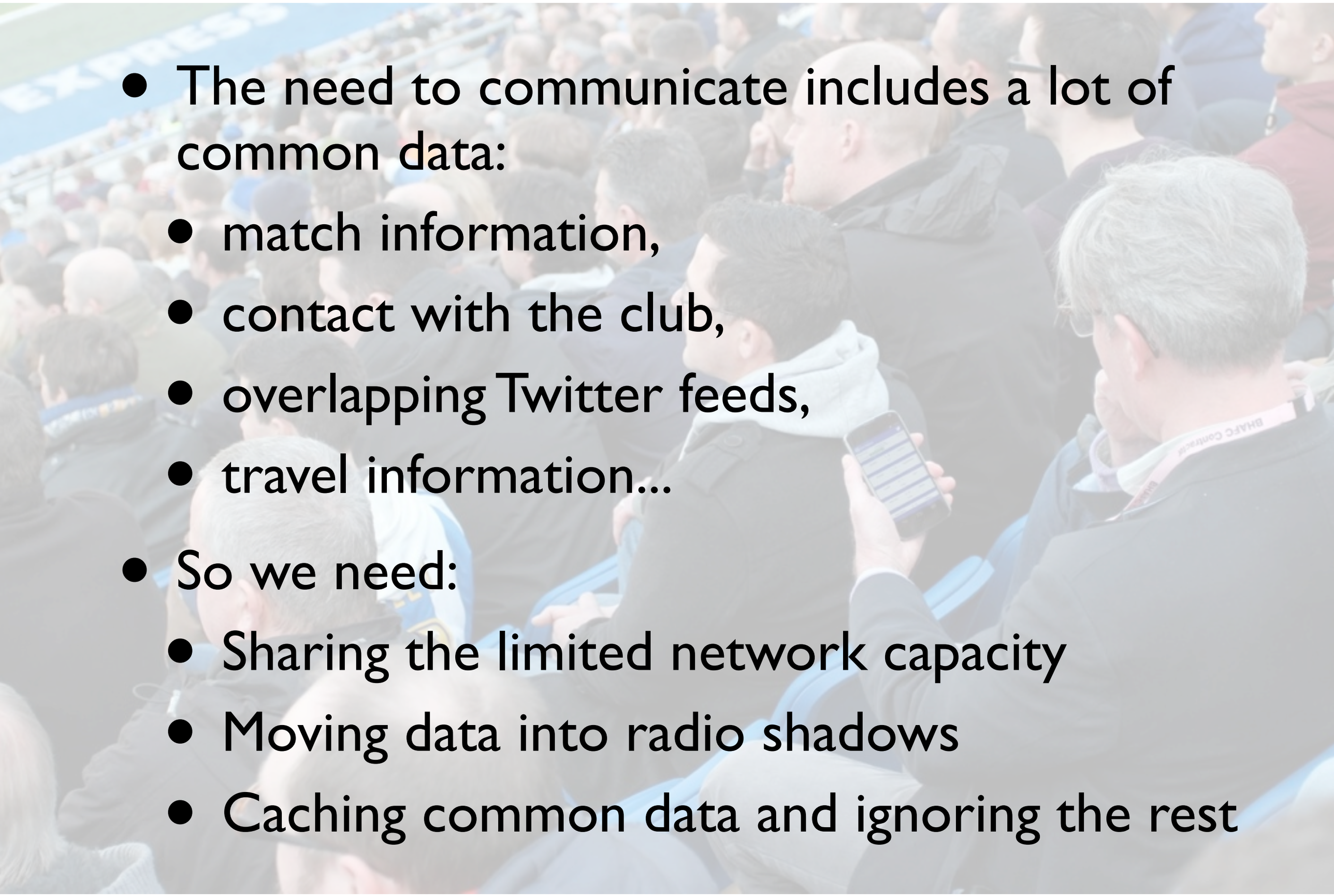
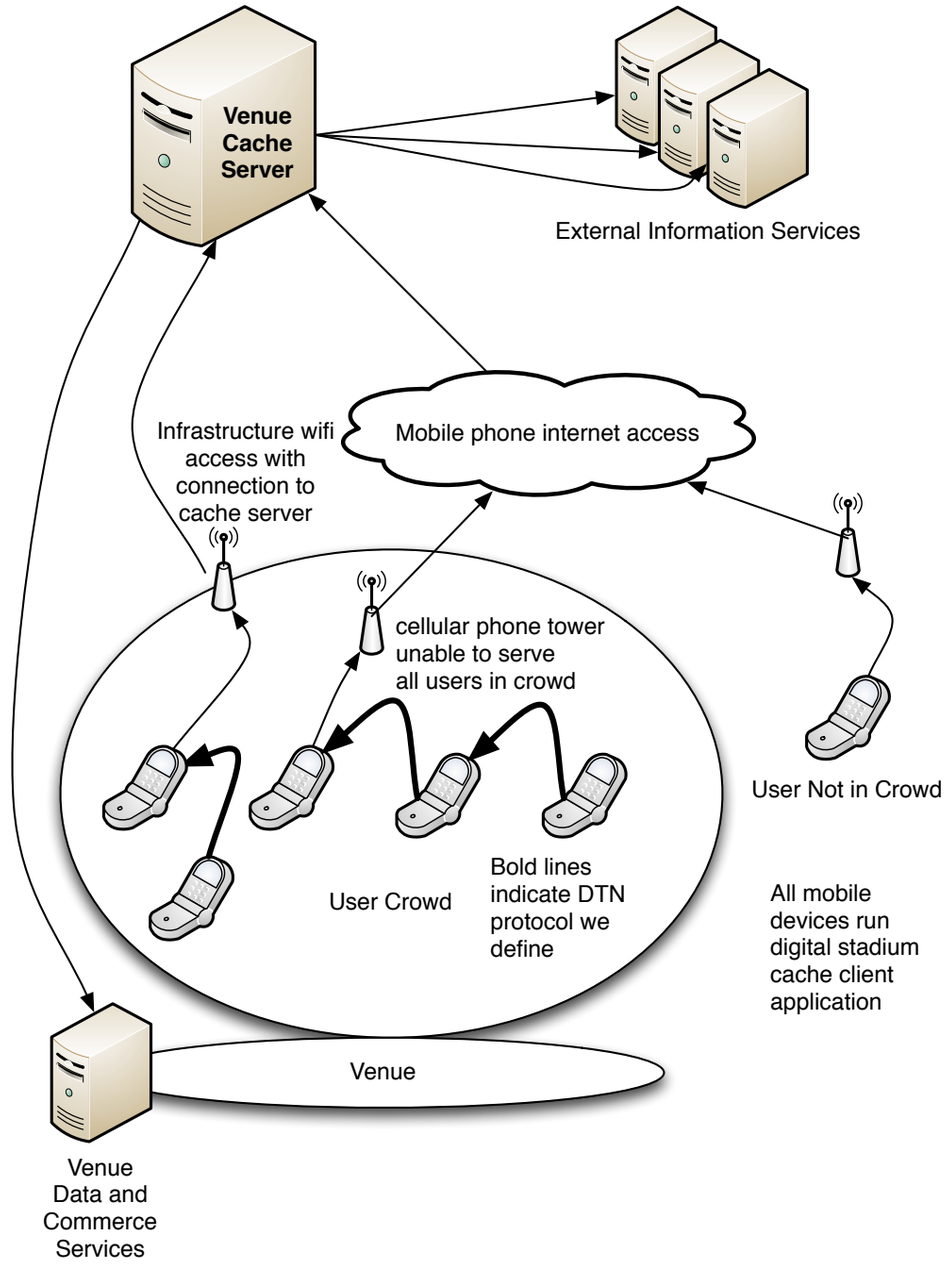
much credit to
Ian Wakeman, Ciaran Fisher, Jon Rimmer,
Stephen Naicken, Ben Horsfall & Ioannis Argyriou


A lot of people but not very often
+
Building that blocks radio
=
A need to communicate
+
Terrible wireless connectivity



- The need to communicate includes a lot of common data:
  - match information,
  - contact with the club,
  - overlapping Twitter feeds,
  - travel information...
- So we need:
  - Sharing the limited network capacity
  - Moving data into radio shadows
  - Caching common data and ignoring the rest

- Which comes out at a DTN built as a cache:
  - Asynchronous interactions between UI and cache / network
  - Store and forward later into radio shadows
  - Store and forward later when changing network mode
  - Pushing data where it is requested
- Context-aware: only switches on at match time / place



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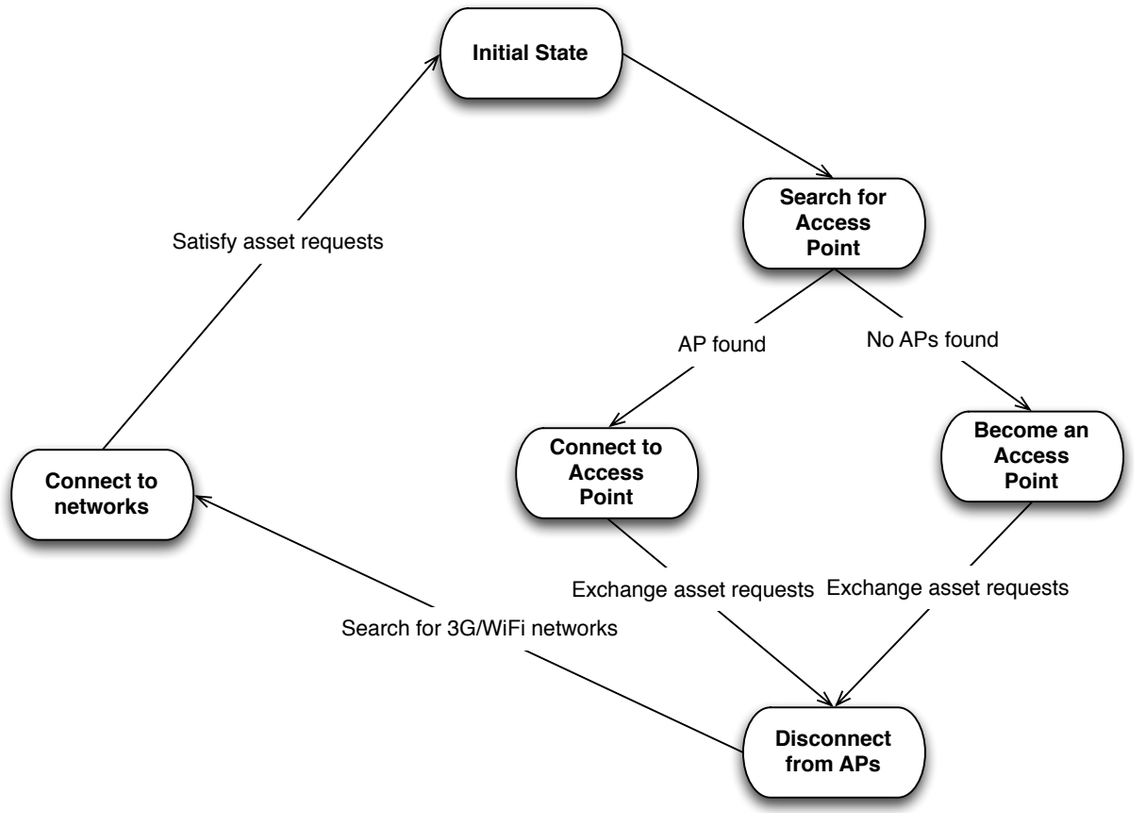
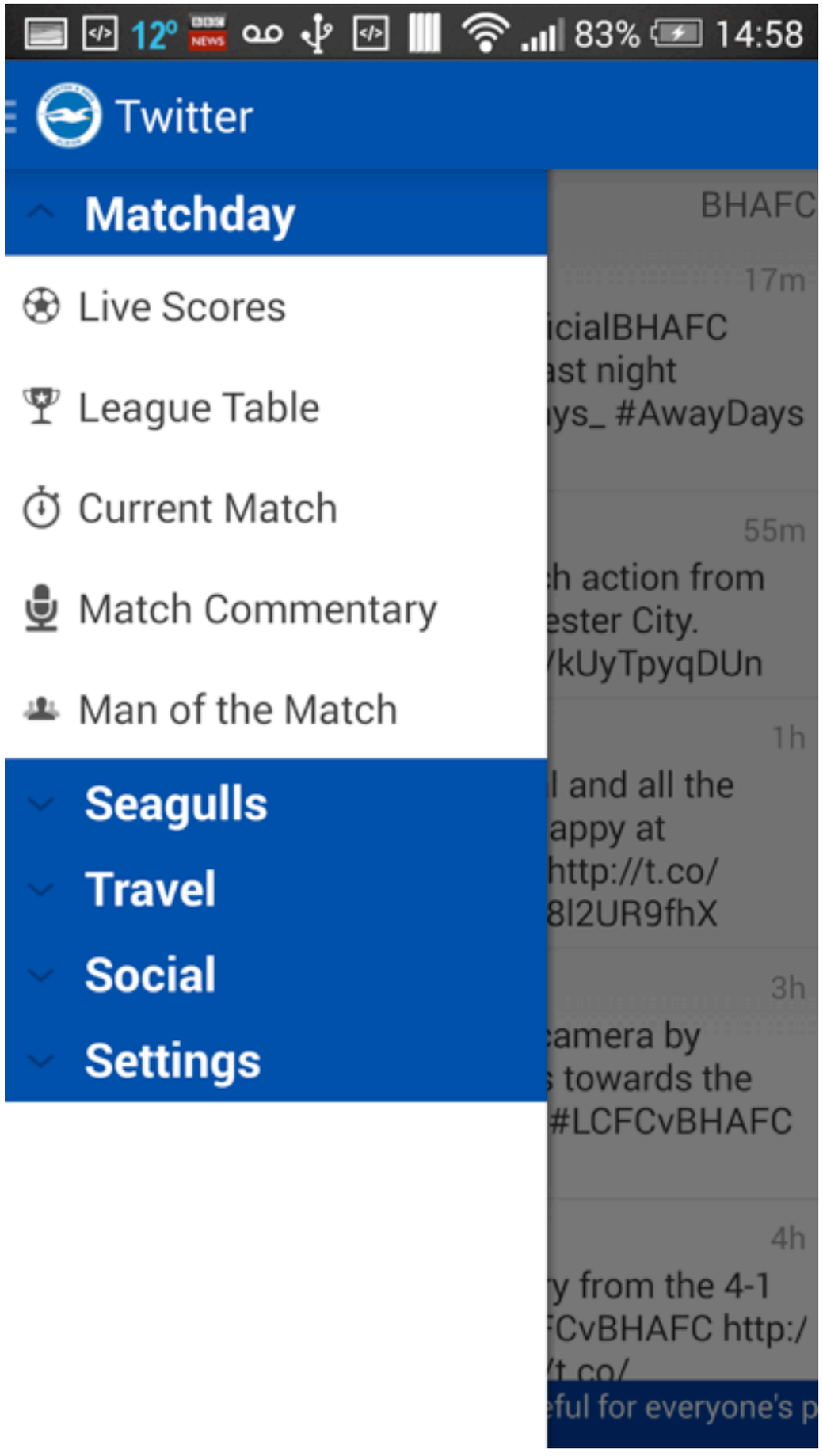
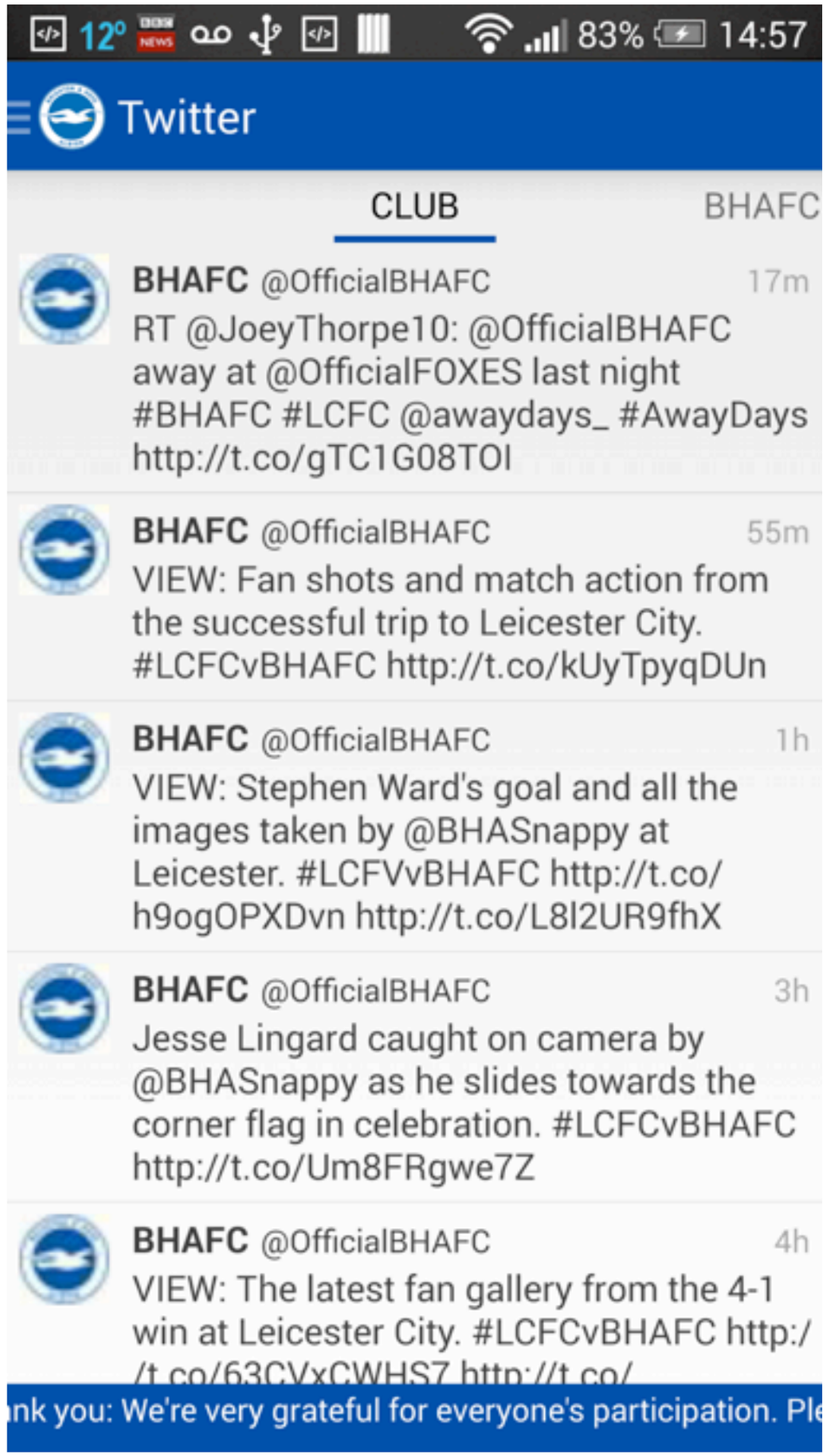


- Updating UI:
  - User enters view
  - View requests asset from cache
  - Cache hit: respond to UI
  - Cache hit but stale: respond to UI, mark as old, request asset from network



- Updating cache over DTN:
  - Exchange asset lists
  - Prune POST lists where done
  - Send POSTs
  - Request new / updated assets in own list
  - Send requested assets where held
  - Notify UI of updates to current view

- Updating cache with server:
  - Send POSTS, server makes POST with end-point if first arrival and sends response asset
  - Update any assets in list

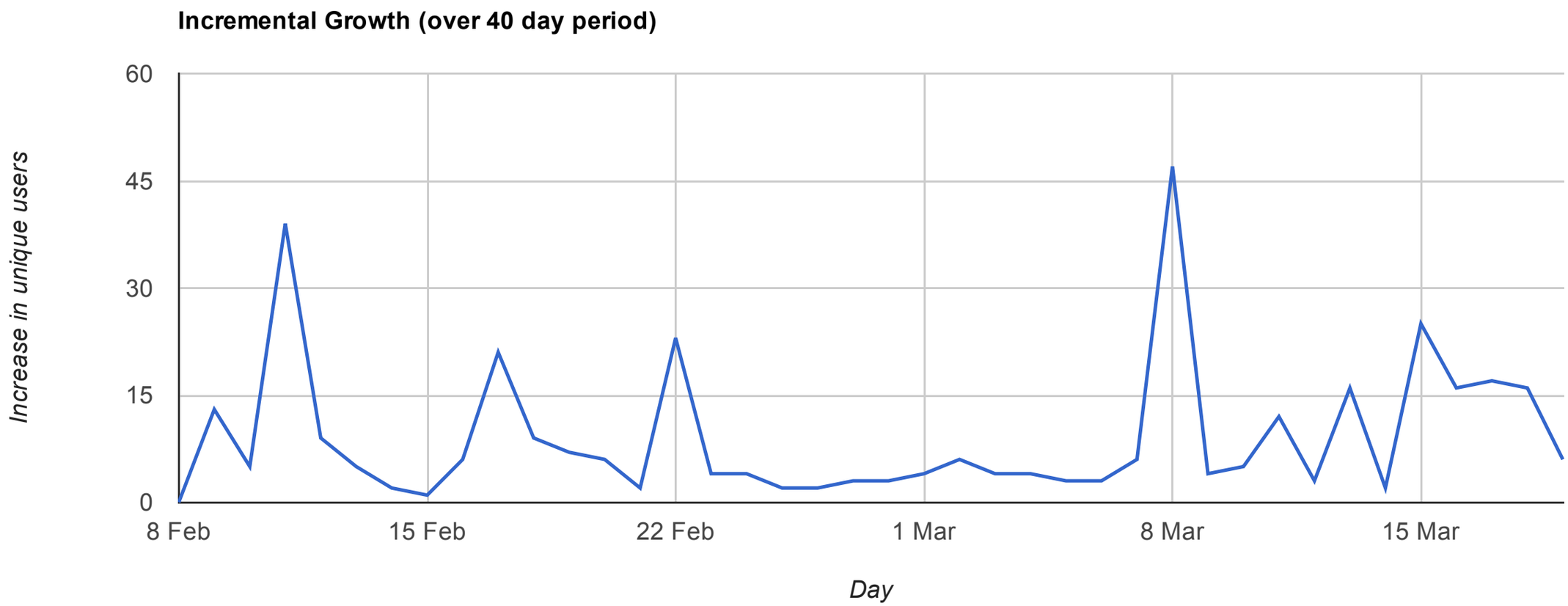


Results!

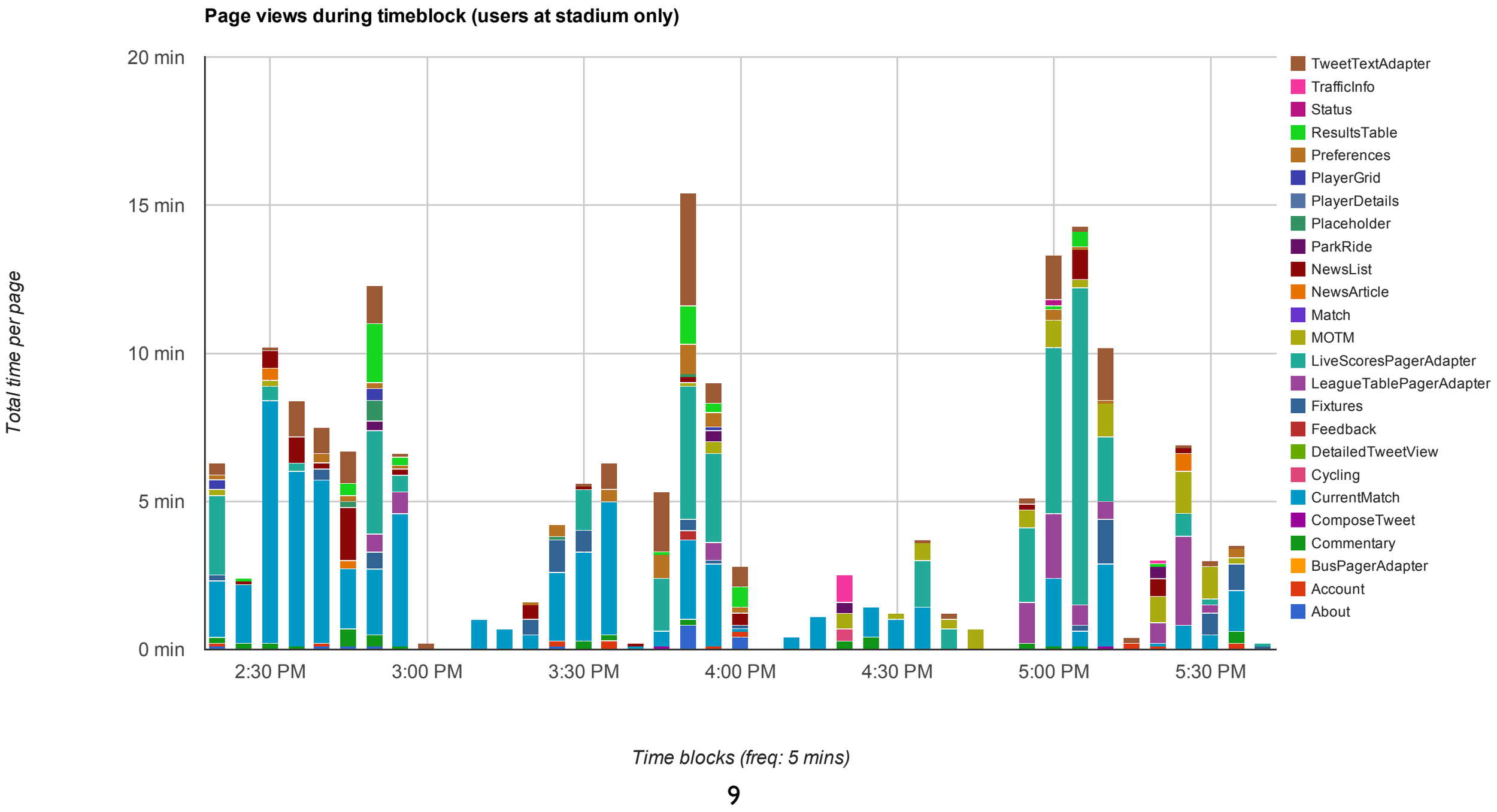
Short Version:

We're Very Pleased
and
More Clubs Are Deploying Now

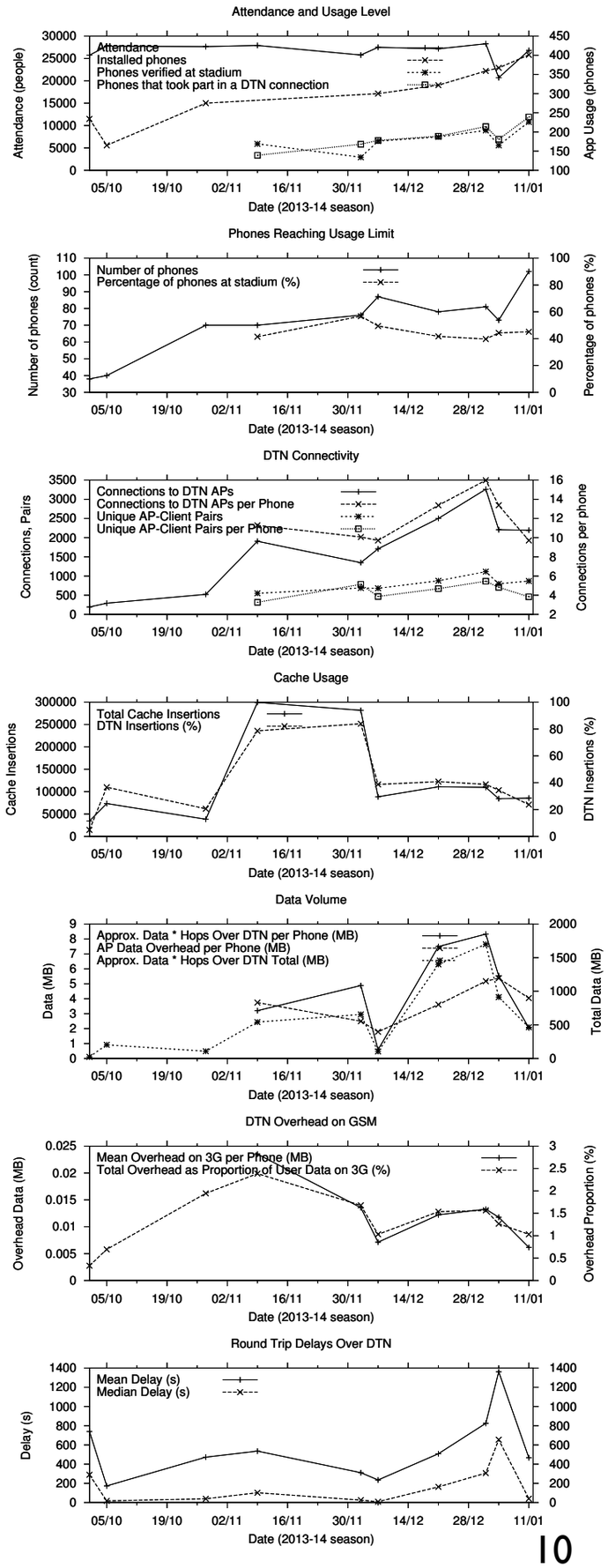
- Deployed at all 27 home games in 2013/14 season - 81 hours of DTN operation
- 710 downloads of Android version (iOS version didn't have DTN last season)



Time Spent Using App



- Performance evolved with software and users
- By end of season, typical per-match (3hr window) stats:
  - Installed on approx. 400 phones, 150-250+ took part in DTN, 600-1000 phone pairings (unique directed pairs)
  - 400-1GB transferred over DTN, 15-20% of app traffic used DTN
  - But, average just 1-2% traffic overhead on users' own app use
  - 40-60s median round trip time
  - 40-50% hit battery limit



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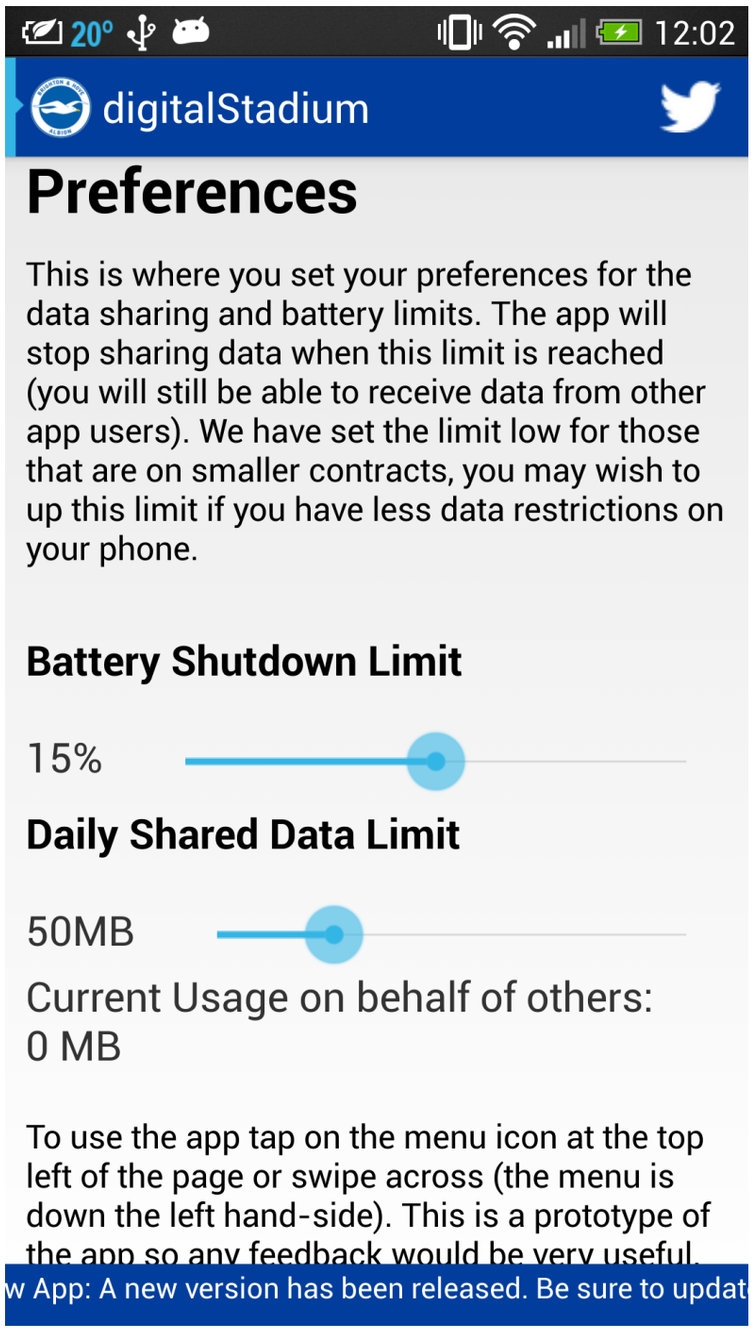

Conclusions

- More people and for longer than the rest!
- Works with a big mix of devices:
  Android and (just recently, not last season iOS),
  not rooted, user-installed from App and Play store
- No expensive infrastructure investment
- Enough delay to tolerate that the UI needs to signal delay, even while remaining interactive
- Coming to a stadium near you next season!